

Motor-Driven Compass Saw Machine

Prior Art

- 5 The present invention is based on a motor-driven compass saw machine that has the species-defining characteristics of claim 1.

 A hand-guided, motor-driven compass saw machine with an oscillation mechanism is known from DE 198 06 675. This oscillation mechanism deflects
10 the saw blade, which is secured in a lifter rod, in the cutting direction by means of a roller lever. This deflection in the cutting direction, which is referred to as an oscillation stroke, results in a faster forward progress of the saw. The oscillation stroke can be adjusted by means of an adjusting knob; discrete adjustments of the deflection can only be selected in steps. A stop that the roller lever strikes
15 against when it is deflected limits the maximum deflection, which is different in each fixed step.

 The greater the oscillation is, the faster the cut progresses. But the cutting quality suffers as a result of this because it produces tear-outs at the
20 edges of the cut as well as rough cut surfaces. In addition, cutting control decreases as the cutting speed increases. But switching between the individual oscillation stages by rotating the stop is complicated, as a result of which it is regularly not carried out during sawing. But this really should be done since requirements for cutting processes change frequently. Thus, for straight parts, a
25 rapid cutting speed is preferable, but in tricky, curved passages, or when carefully starting a cut, a slow cutting speed with a higher cutting quality is preferable. Both of the above-mentioned extremes can alternate continuously, thus requiring the user to constantly adjust the oscillation.

30 Advantages of the Present Invention

A hand-guided, motor-driven compass saw machine with the characteristics of claim 1 has the advantage over the prior art that the forward saw progress changes automatically by means of an adaptive, automatic oscillation that is a function of the advancing force in the cutting direction.

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Preferably, this occurs by means of a spring element that is compressed further as the advancing force, i.e. the cutting speed, increases. This means that when sawing straight parts at a high speed, the spring element is compressed very powerfully and consequently, a large oscillation is produced. However, 10 when sawing tricky, curved passages, only an extremely low advancing force is exerted on the saw blade so that the spring element is hardly compressed at all. This results in only a very slight oscillation of the saw blade. Preferably, the oscillation is also jointly controlled by means of a damping device. The spring forces specified in detail below are understood to be the resultant spring force 15 acting on the roller in the horizontal direction.

The provision of a second stop on the housing, above the roller lever, in the region of its end oriented away from the roller, makes it possible to preset a maximum oscillation. Preferably, the second stop is embodied so that it can be 20 set to various distances from the roller lever by means of an adjusting knob. This makes it possible to set the maximum oscillation in various stages.

The fact that the compass saw machine has a shutoff mechanism, in particular a mechanical device for compressing the spring element, which shutoff 25 mechanism suppresses the parallel component of the spring element, makes it very easy to switch off the automatic oscillation. For example, it is then possible to very easily switch back and forth between an oscillation mechanism known from the prior art and the oscillation mechanism according to the present invention.

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Other advantageous embodiments of the present invention are the subject of the dependent claims.

Drawings

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An exemplary embodiment of the invention will be explained in greater detail in the following description in conjunction with the accompanying drawings.

- Fig. 1 is a vertical longitudinal section through a compass saw machine according to the present invention,
- Fig. 2 is a vertical cross section through the compass saw machine according to Fig. 1 in the direction II – II,
- Fig. 3 is a horizontal longitudinal section through the compass saw machine from Fig. 1, along the line III – III,
- Fig. 4 shows a schematic design for a roller mechanism according to the prior art, with the curve of the deflection over time, and
- Fig. 5 shows a schematic design for an oscillation mechanism according to the present invention, with the curve of the deflection over time.

The sectional views in Figs. 1 through 3 permit a thorough description to be given for a hand-guided, motor-driven compass saw machine 1. Fig. 4 shows the mechanism that has been used up to now for producing an oscillation and Fig. 5 shows a very simple embodiment form of the oscillation mechanism according to the present invention.

The compass saw machine 1 shown in Fig. 1 has a housing 2 in which a saw blade 3 reciprocates in the vertical direction. To that end, the saw blade 3 is

secured in a lifter rod 4, which a motor sets into a vertical reciprocating motion in an intrinsically known fashion. Since the driving of the lifter rod 4 as well as its support and guidance are known in and of themselves and are not the subject of the present invention, they are not described in greater detail here. The

5 compass saw machine 1 has an oscillation mechanism that imparts an oscillation, which is oriented lateral to the vertical reciprocating motion, to the lifter rod 4 with the saw blade 3. This results in a greater rate of material removal and therefore a faster forward saw progress when the compass saw machine 1 is moved in a working direction x. An oscillation mechanism of this kind is
10 basically known. The discussion below begins with an oscillation mechanism according to the prior art (see Fig. 4) and then moves on to the oscillation mechanism according to the present invention (see Fig. 5).

The known oscillation mechanism has a two-armed roller lever 5 that is
15 supported in the housing 2 so that it can rotate in seesaw fashion around a horizontal first axis 50. At the bottom end of the first lever arm, the roller lever 5 has a roller 51 that is supported so that it can rotate around a second horizontal axis 55. The second lever arm is bent at a 90-degree angle so that the end 52 oriented away from the roller extends horizontally. A compression spring 53
20 exerts a force that prestresses the upper lever arm down against a first stop 20 in the idle position of the roller lever 5.

If the compass saw machine 1 is moved in the working direction x in relation to a work piece so that an advancing force F_3 acts on the saw blade 3,
25 the blade pushes the roller 51 and therefore the first lever arm of the roller lever 5 toward the rear. At the same time, compression springs 40 that exert a compressive spring force F_2 between the housing 2 and the lifter rod 4 (see Fig. 3) continuously press the saw blade 3 against the roller 51.

30 A projection 60 (Fig. 2) of a fork lever 6 rests against the end 52 of the roller lever 5 oriented away from the roller. By means of a cam, a drive motor

(not shown) moves the fork lever 6 back and forth periodically, causing it to execute an up and down motion (see Figs. 2 and 4). As a result, the end 52 of the roller lever 5 oriented away from the roller is deflected periodically up and down (see the deflection curve over time in Fig. 4). This means that when the
5 projection 60 of the Fork lever 6 pushes the roller lever 5 down, this presses the roller 51 in the working direction x counter to the advancing force F_3 so that the saw blade 3 executes a rapid forward saw progress.

But since a powerful oscillation for a rapid forward saw progress has the
10 disadvantage of a lower cutting quality, it is only suitable for sawing straight segments and should not be used for filigree work or sharply bending cutting curves. A second stop 21 (see Figs. 2 and 4) is provided for this purpose.

The distance of this second stop from the idle position of the end 52 of the
15 roller lever 5 oriented away from the roller limits the maximum upward deflection of the end 52 of the roller lever 5 oriented away from the roller and limits the oscillation stroke of the saw blade 3. With such a stroke limitation of the roller lever 5, the constant deflection stroke of the projection 60 of the fork lever 6 remains greater than that of the roller lever 5 and only a slower forward saw
20 progress occurs as the maximum.

An adjusting knob makes it possible to manually set the second stop 21 from the outside to different distances from the end 52 of the roller lever 5 oriented away from the roller. The left part of Fig. 4 shows three sample settings
25 (P_0 , P_I , P_{III}) at different distances from the end 52 of the roller lever 5 oriented away from the roller. In order to simplify the depiction, these positions are shown next to one another. Depending on the mechanical design of the second stop 21, however, these settings are either all disposed one above the other or are disposed next to one another in a very limited horizontal range. The right part of
30 Fig. 4 shows the effects that the four positions (P_0 through P_{III}) of the second stop 21 have on the curve over time of the deflection of the end 52 of the roller

lever 5 oriented away from the roller. At the lowest setting P_0 , no oscillation at all occurs, whereas at the highest setting P_{III} , the full oscillation is possible, which manifests itself in the form of a sinusoidal curve in the depiction of the deflection over time. At the intermediate settings P_I , P_{II} , the maxima of the deflection are
5 each cut off vertically at the height at which the second stop 21 is located in the respective position P_I , P_{II} above the end 52 of the roller lever 5 oriented away from the roller when the roller lever 5 is in its neutral position.

In an oscillating mechanism according to the present invention according
10 to Fig. 5, the movement of the roller lever 5 likewise occurs in a known fashion via the fork lever 6. The deflection by means of the advancing force F_3 occurs in the same manner as in the known oscillation mechanism. Underneath the end 52 of the roller lever 5 oriented away from the roller, a first stop 20 is provided on the housing 2 (see Figs. 1 and 5). Also in the region of the end 52 of the roller
15 lever 5 oriented away from the roller, a spring element in the form of a spring 53 is provided between the housing 2 and the roller lever 5 and exerts a spring force F_1 between them. The spring 53 acts on the roller lever 5 in the same direction as the fork lever 6. Between the housing 2 and the end 52 of the roller lever 5 oriented away from the roller, a damping device 54 is also provided for damping
20 the oscillation of the roller lever 5. The spring force F_1 of the spring 53 is greater than the compressive spring force F_2 of the compression springs 40 (see Fig. 3).

As long as the advancing force F_3 is weaker than the difference of the spring force F_1 and the compressive spring force F_2 , the spring 53 constantly
25 presses the end 52 oriented away from the roller against the first stop 20. As a result, no oscillation occurs. This corresponds to the known oscillating mechanism (see Fig. 4) in position P_0 of the second stop 21. If the advancing force F_3 is slowly increased, then the spring 53 is compressed and the projection 60 of the fork lever 6 imparts a periodic up and down motion to the end 52 of the
30 roller lever 5 oriented away from the roller. The spring 53 exerts a force that presses the end 52 of the roller lever 5 oriented away from the roller down

against the first stop 20. This results in a slow forward saw progress. But as the advancing force F_3 increases, the deflection of the end 52 of the roller lever 5 oriented away from the roller increases in opposition to the spring force F_1 of the spring 53. This results in an ever greater forward saw progress within the limits of the presettable maximum oscillation stroke. If the advancing force F_3 exceeds a predetermined value for the difference between the spring force F_1 of the spring 53 and the compressive spring force F_2 of the compression springs 40, then the maximum deflection of the roller lever 5 occurs, which corresponds to the oscillation stage P_{III} of the second stop 21 (see Fig. 4).

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The above-described oscillation mechanism according to the present invention has the advantage over the prior art that it automatically adjusts itself adaptively to the circumstances of the forward saw progress currently required. During a straight cut, the compass saw machine 1 is moved at a high speed in the working direction x so that a high advancing force F_3 is produced. This means (see above) that a more powerful pressure is exerted on the saw blade and therefore a greater degree of oscillation occurs, thus achieving a particularly rapid forward saw progress. By contrast, when sawing sharply curved or filigreed contours, only an extremely low advancing force F_3 is achieved since the compass saw machine 1 is only moved at a very low speed in the working direction x . If the advancing force F_3 is less than difference between the spring force F_1 of the spring 53 and the compressive spring force F_2 of the compression springs 40, then no oscillation of the saw blade occurs at all, which results in a slow forward saw progress and a very high degree of cutting precision.

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The oscillation mechanism according to the present invention can be combined with a second stop 21 described above (see Figs. 2 and 4) so that in any case, even with a powerful advancing force F_3 , a presettable maximum oscillation occurs, with a maximum forward saw progress.